AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A wireless communication receiver comprising:

an antenna array comprising an antenna which provides signals for each of successive sets of pilot data;

a joint searcher and channel estimator arranged ~~for~~ to essentially concurrently consider~~ing~~ the plural signals for the respective successive sets of pilot data for determining both a time of arrival and channel coefficient.

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Currently Amended) The apparatus of claim 1, wherein each of the sets of pilot data is represented by a pilot set index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of the signal received in a sampling window is stored as a function of a sampling window time index and the pilot set index;

a correlator ~~which uses~~configured to use the antenna signal matrix to generate a correlator output;

a correlator output analyzer ~~which uses~~configured to use the correlator output to generate the time of arrival and the channel coefficient.

7. (Currently Amended) The apparatus of claim 6, wherein in performing the calculation the correlator considers a dimensional receptivity vector formed from the antenna signal matrix with respect to a sampling window time index for the plural sets of pilot data, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity vector, the plural possible frequencies being represented by a frequency index; and

wherein for each combination of plural possible frequencies and plural time indexes, the correlator ~~calculates~~configured to calculate:

Y(n,t) = FFT(n,X(:,t))

wherein t is the sampling window time index;

X(:,t) is the complex antenna matrix; and

n is the frequency index.

8. (Currently Amended) The apparatus of claim 7, wherein for each combination of plural possible frequencies and plural time indexes, the correlator ~~calculates~~being configured to calculate:

Y(n,t) = Σ C_j *FFT(n,X(:,t)), j = 1,K

wherein C_j is a coding sequence symbol value j and K is a length of the coding sequence.

9. (Original) The apparatus of 7, wherein each of the plural possible frequencies corresponds to a doppler shift.

10. (Currently Amended) The apparatus of 9, wherein the correlator output comprises Y(n,t), and wherein the analyzer is configured to determine ~~determines~~ a maximum absolute value $|Y(n,t)|_{max}$, wherein the analyzer uses a sampling window time index t_max at which $|Y(n,t)|_{max}$ occurs to determine the time of arrival of an arriving wavefront; and wherein the analyzer uses the a frequency index n_max at which $|Y(n,t)|_{max}$ to determine the doppler shift.

11. (Original) The apparatus of 7, wherein the correlator output comprises Y(n,t), and wherein the analyzer determines a maximum absolute value $|Y(n,t)|_{max}$, wherein the analyzer obtains an amplitude for an arriving wavefront by dividing $|Y(n,t)|_{max}$ by a number of sets of pilot data in the series.

12. (Currently Amended) The apparatus of claim 1, wherein each of the sets of pilot data is represented by a pilot set index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of the signal received in a sampling window is stored as a function of a sampling window time index and the pilot set index;

a parametric estimator ~~which uses~~configured to use complex values in the antenna matrix to generate a parametric output estimation vector

an analyzer ~~which uses~~configured to use the parametric output estimation vector to generate the time of arrival and the channel coefficient.

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Original) A method of operating a wireless communication receiver comprising:

obtaining from an antenna element signals for each of successive sets of pilot data;

concurrently using the signals for each of successive sets of pilot data for determining both a time of arrival and channel coefficient.

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Original) The method of claim 16, wherein each of the sets of pilot data is represented by a pilot set index, wherein the step of concurrently using the plural signals for determining both the time of arrival and the channel coefficient is performed by a joint searcher and channel estimator, and further comprising the steps of the joint searcher and channel estimator:

storing a complex value indicative of the signal received in a sampling window an antenna signal matrix as a function of a sampling window time index and the pilot set index;

performing a Fast Fourier Transformation (FFT) calculation to generate a correlator output;

using the correlator output to generate the time of arrival and the channel coefficient.

22. (Original) The method of claim 21, wherein in performing the calculation the correlator considers

a dimensional receptivity vector formed from the antenna signal matrix with respect to a sampling window time index for the plural sets of pilot data, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity vector, the plural possible frequencies being represented by a frequency index; and

wherein for each combination of plural possible doppler frequencies and plural time indexes, the correlator calculates:

$Y(n,t) = FFT(n,X(:,t))$

wherein t is the sampling window time index;

$X(:,t)$ is the complex antenna matrix; and

n is the doppler frequency index.

23. (Original) The method of claim 22, wherein for each combination of plural possible frequencies and plural time indexes, the method comprises evaluating the following expression:

$Y(n,t) = \Sigma\ C_j * FFT(n,X(:,t)),\ j = 1,K$

wherein C_j is a coding sequence symbol value j and K is the length of the coding sequence.

24. (Original) The method of claim 22, wherein the correlator output comprises Y(n,t), and further comprising determining a maximum absolute value $|Y(n,t)|_{max}$.

25. (Original) The method of 24, further comprising:

using a sampling window time index t_max at which $|Y(n,t)|_{max}$ occurs to determine the time of arrival of an arriving wavefront; and

using the doppler frequency index n_max at which $|Y(n,t)|_{max}$ to determine the doppler shift direction.

26. (Original) The method of 24, further comprising obtaining an amplitude for the arriving wavefront by dividing $|Y(n,t)|_{max}$ by a number of sets of pilot data in the series.

27. (Original) The method of claim 16, wherein each of the sets of pilot data is represented by a pilot set index, and wherein the method further comprises:

storing, in an antenna signal matrix, a complex value indicative of the signal received in a sampling window as a function of a sampling window time index and the pilot set index;

forming a parametric estimate using complex values in the antenna matrix and generating a parametric output estimation vector;

using the parametric output estimation vector to generate the time of arrival and the channel coefficient.

28. (Cancelled)

29. (Cancelled)

30. (Cancelled)

31. (Currently Amended) The apparatus of claim 1, wherein the joint searcher and channel estimator is arranged ~~for~~ to essentially concurrently consider~~ing~~ the plural signals for the respective successive sets of pilot data for determining both a time of arrival and channel coefficient by essentially concurrently operating upon a two dimensional functionally dependent matrix, the signals being stored in the matrix as a function of two different indices, a first index being a time index of a sampling window employed for each of the sets of pilot data and a second index indicating for which one of the successive sets of pilot data the signal was obtained.

32. (Currently Amended) The apparatus of claim 1, wherein the joint searcher and channel estimator is arranged ~~for~~ to essentially concurrently consider~~ing~~ the plural signals for the respective successive sets of pilot data for determining both a time of arrival and channel coefficient by essentially concurrently operating upon a matrix which stores signals which are dimensionally differentiated by being acquired in differing frame transmission intervals.

33. (Previously Presented) The method of claim 16, further comprising concurrently using the signals for each of successive sets of pilot data for determining both a time of arrival and channel coefficient by essentially concurrently operating upon a two dimensional functionally dependent matrix, the signals being stored in the matrix as a function of two different indices, a first index being a time index of a sampling window employed for each of the sets of pilot data and a second index indicating for which one of the successive sets of pilot data the signal was obtained.

34. (Previously Presented) The method of claim 16, further comprising concurrently using the signals for each of successive sets of pilot data for determining both a time of arrival and channel coefficient by essentially concurrently operating upon a matrix which stores signals which are dimensionally differentiated by being acquired in differing frame transmission intervals.

Please add the following new claims:

35. (New) A wireless communication receiver comprising:

an antenna structure arranged to acquire dimensionally differentiated signals;

a joint searcher and channel estimator arranged to essentially concurrently consider the dimensionally differentiated plural signals provided by the antenna structure for determining both a time of arrival and channel coefficient.

36. (New) The apparatus of claim 35, wherein the joint searcher and channel estimator is arranged to essentially concurrently consider the dimensionally differentiated plural signals provided by the plural antennas for determining plural times of arrival and plural channel coefficients, an arriving wavefront being represented by one of the plural times of arrival and a corresponding one of the plural channel coefficients.

37. (New) The apparatus of claim 35, wherein the antenna structure comprises an array of plural antennas, and wherein the signals acquired by different antennas of the array are dimensionally differentiated with regard to a spatial dimension.

38. (New) The apparatus of claim 35, wherein the antenna structure comprises an antenna arranged to provide signals for each of successive sets of pilot data received by the antenna as the dimensionally differentiated signals, whereby the signals acquired by the antenna are dimensionally differentiated with regard to a temporal dimension.

39. (New) The apparatus of claim 35, wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which complex values indicative of the dimensionally differentiated signal received in a sampling window are stored as a function of a sampling window time index and a dimensional differentiation index;

a correlator arranged to locate value(s) in the antenna signal matrix for use in determining the time of arrival and the channel coefficient;

an analyzer arranged to use the value(s) located by the correlator to generate the time of arrival and the channel coefficient.

40. (New) The apparatus of claim 39, wherein in locating the values the correlator considers a dimensional reception vector formed from the antenna signal matrix with respect to a sampling window time index, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity, the plural possible frequencies being represented by a frequency index; and

wherein for each combination of plural possible frequencies and plural time indexes, the correlator is arranged to calculate:

$Y(n,t) = FFT(n,X(:,t))$

wherein t is the sampling window time index;

$X(:,t)$ is the complex antenna matrix, with : representing all antenna indexes for one sampling window time index;

n is the frequency index.

41. (New) The apparatus of claim 40, wherein for each combination of plural possible frequencies and plural time indexes, the correlator is further arranged to calculate:

$Y(n,t) = \Sigma\ C_j *FFT(n,X(:,t)), j = 1,K$

wherein C_j is a coding sequence symbol value j and K is a length of the coding sequence.

42. (New) The apparatus of claim 40, wherein the antenna structure comprises an array of plural antennas, and wherein each of the plural possible frequencies for the dimensional receptivity vector represents a different possible direction of arrival of the arriving wavefront.

43. (New) The apparatus of claim 40, wherein the antenna structure comprises an antenna which provides signals for each of successive sets of pilot data received by the antenna as the dimensionally differentiated signals, and wherein each of the plural possible frequencies corresponds to a doppler shift.

44. (New) The apparatus of claim 35, wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which complex values indicative of the dimensionally differentiated signal received in a sampling window are stored as a function of a sampling window time index and a dimensional differentiation index;

a parametric estimator arranged to use complex values in the antenna matrix and generates a parametric output estimation vector;

an analyzer arranged to use the parametric output estimation vector to generate the time of arrival and the channel coefficient.

45. (New) The apparatus of claim 44, wherein the antenna structure comprises an array of plural antennas, and wherein each spatial frequency parameter in the parametric output estimation vector corresponds to a possible direction of arrival.

46. (New) A method of operating a wireless communication receiver comprising:

acquiring dimensionally differentiated signals at an antenna structure;

concurrently using the dimensionally differentiated signals for determining both a time of arrival and channel coefficient.

47. (New) The method of claim 46, wherein the antenna structure comprises an array of plural antennas, and further comprising acquiring the dimensionally differentiated signals from different antennas of the array whereby the signals are dimensionally differentiated with regard to a spatial dimension.

48. (New) The method of claim 46, further comprising receiving, at an antenna of the antenna structure, signals for each of successive sets of pilot data received by the antenna as the dimensionally differentiated signals, whereby the signals acquired by the antenna are dimensionally differentiated with regard to a temporal dimension.

49. (New) The method of claim 46, further comprising

storing, in an antenna signal matrix, complex values indicative of the dimensionally differentiated signals received in a sampling window as a function of a sampling window time index and a dimensional differentiation index;

locating value(s) in the antenna signal matrix for use in determining the time of arrival and the channel coefficient;

using the value(s) located to generate the time of arrival and the channel coefficient.

50. (New) The method of claim 49, the step of locating the values further comprises using a dimensional reception vector formed from the antenna signal matrix with respect to a sampling window time index, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity, the plural possible frequencies being represented by a frequency index; and

wherein for each combination of plural possible frequencies and plural time indexes, calculating:

$Y(n,t) = FFT(n,X(:,t))$

wherein t is the sampling window time index;

$X(:,t)$ is the complex antenna matrix, with : representing all antenna indexes for one sampling window time index;

n is the frequency index.

51. (New) The method of claim 50, wherein for each combination of plural possible frequencies and plural time indexes, calculating:

$Y(n,t) = \Sigma\, C_j * FFT(n,X(:,t)), j = 1,K$

wherein C_j is a coding sequence symbol value j and K is a length of the coding sequence.

52. (New) The method of claim 50, wherein the antenna structure comprises an array of plural antennas, and wherein each of the plural possible frequencies for the dimensional receptivity vector represents a different possible direction of arrival of the arriving wavefront.